

### **AMENDMENTS TO THE CLAIMS**

Please amend the claims as follows:

1. (cancelled)

2. (Currently Amended) The method according to claim 71, wherein a frequency of 1.3 times the first series resonant frequency  $f_0$  is larger than a power frequency  $f_e$ .

3. (Currently Amended) The method according to claim 2, wherein the first series resonant frequency  $f_0$  is larger than three times the power frequency  $f_e$ .

4. (Currently Amended) The method according to claim 3, wherein a series resonant frequency  $f_0'$  which is defined by a capacitance between the plasma excitation electrode and a counter electrode for generating the plasma in cooperation with the plasma excitation electrode, is larger than three times the power frequency  $f_e$ .

5. (Currently Amended) The method according to claim 4, wherein the plasma excitation electrode and the counter electrode are of a parallel plate type, and the series resonant frequency  $f_0'$  and the power frequency  $f_e$  satisfy the relationship:

wherein  $d$  represents the distance between the plasma excitation electrode and the counter electrode, and  $\delta$  represents the sum of the distance between the plasma excitation electrode and the generated plasma and the distance between the counter

$$f_0' > \sqrt{\frac{d}{\delta}} f_e$$

electrode and the generated plasma.

6. (Currently Amended) The method according to claim 71, further comprising a resonant frequency measuring terminal for measuring a resonant frequency of the plasma processing chamber, in the vicinity of the end of the radio frequency feeder.

7. (Currently Amended) The method according to claim 6, further comprising a switch provided between the radio frequency feeder and the resonant

frequency measuring terminal, wherein the switch electrically disconnects the end of the radio frequency feeder from the resonant frequency measuring terminal and connects the end of the radio frequency feeder to the output end of the matching circuit in a plasma excitation mode in which the plasma is excited, whereas the switch electrically connects the end of the radio frequency feeder to the resonant frequency measuring terminal and disconnects the end of the radio frequency feeder from the resonant frequency measuring terminal in a measuring mode in which the resonant frequency of the plasma processing chamber is measured.

8. (Currently Amended) The method according to claim 6, further comprising a resonant frequency measuring unit which is detachably connected to the resonant frequency measuring terminal.

9 – 62. (Cancelled)

63. (Cancelled)

64. (Currently amended) The method according to claim 72, wherein the plasma excitation electrode comprises an overlapping area with respect to the chamber wall, the overlapping area adapted to set the first series resonant frequency  $f_0$  such that three times the first series resonant frequency  $f_0$  is larger than a power frequency  $f_e$  supplied from the radio frequency generator.

65. (Currently amended) The method according to claim 72, wherein the radio frequency feeder has a length adapted to set the first series resonant frequency  $f_0$  such that three times the first series resonant frequency  $f_0$  is larger than a power frequency  $f_e$  supplied from the radio frequency generator.

66. (Cancelled)

67. (Currently amended) The method according to claim 73, wherein at least one of the shape of a feed plate, the overlapping area of the plasma excitation electrode and a chamber wall, insulation material between the plasma excitation electrode and the chamber wall, or the capacitance between a susceptor electrode and

the chamber wall is adjusted such that 1.3 times the first series resonant frequency  $f_0$  is larger than a power frequency  $f_e$ .

68. (Currently amended) The method according to claim 73, wherein at least one of the shape of a feed plate, the overlapping area of the plasma excitation electrode and a chamber wall, insulation material between the plasma excitation electrode and the chamber wall, or the capacitance between a susceptor electrode and the chamber wall is adjusted such that the first series resonant frequency  $f_0$  is larger than a power frequency  $f_e$ .

69 – 70 (Cancelled)

71. (New) A method of optimizing a plasma processing apparatus, the method comprising:

a) providing a plasma processing chamber having a plasma excitation electrode for exciting a plasma;

b) coupling a radio frequency generator to the plasma excitation electrode with a radio frequency feeder;

1) measuring an impedance path from the radio frequency feeder to ground via a shaft using a variable oscillation frequency during a non-discharge period;

2) calculating a first series resonant frequency  $f_0$  based on the measured impedance path during the non-discharge period, the first series resonant frequency  $f_0$  corresponding to a minimum impedance of the plasma processing chamber;

3) adjusting one or more mechanical parameters of the plasma processing chamber during the non-discharge period to modify the first series resonant frequency  $f_0$  so that the first series resonant frequency  $f_0$  measured at an end of the radio frequency feeder is larger than one-third of a power frequency  $f_e$  measured at the end of the radio frequency feeder; and

c) coupling a matching circuit between the radio frequency generator and the radio frequency feeder to match an impedance between the plasma processing chamber and the radio frequency generator.

72. (New) A method of optimizing a plasma processing apparatus, the method comprising:

a) providing a plasma processing chamber, a counter electrode, and a shower plate, the plasma processing chamber having a plasma excitation electrode for exciting a plasma;

b) coupling a radio frequency generator to the plasma excitation electrode with a radiofrequency feeder; and

1) measuring an impedance path from the radio frequency feeder to ground via a shaft using a variable oscillation frequency during a non-discharge period;

2) calculating a first series resonant frequency  $f_0$  based on the measured impedance path during the non-discharge period, the first series resonant frequency  $f_0$  corresponding to a minimum impedance of the plasma processing chamber;

3) adjusting one or more mechanical parameters of the plasma processing chamber during the non-discharge period such that the first series resonant frequency  $f_0$  measured at an end of the radio frequency feeder is larger than one-third of a power frequency  $f_e$  measured at the end of the radio frequency feeder;

c) coupling a matching circuit between the radio frequency generator and the radio frequency feeder to match an impedance between the plasma processing chamber and the radio frequency generator.

73. (New) A method of optimizing a plasma processing apparatus, the method comprising:

a) providing a plasma processing chamber having a first series resonant frequency  $f_0$  and a plasma excitation electrode for exciting a plasma;

b) coupling a radio frequency generator to the plasma excitation electrode with a radiofrequency feeder; and

1) measuring an impedance path from the radio frequency feeder to ground via a shaft using a variable oscillation frequency during a non-discharge period;

2) calculating the first series resonant frequency  $f_0$  based on the measured impedance path during the non-discharge period, the first series resonant frequency  $f_0$  corresponding to a minimum impedance of the plasma processing chamber;

3) adjusting one or more of a shape of a feed plate, an overlapping area of the plasma excitation electrode and a chamber wall, and the capacitance between a susceptor electrode and a chamber wall such that the first series resonant frequency  $f_0$  measured at an end of the radio frequency feeder is larger than one-third of a power frequency  $f_e$  measured at the end of the radio frequency feeder;

c) coupling a matching circuit between the radio frequency generator and the radio frequency feeder to match an impedance between the plasma processing chamber and the radio frequency generator.